Flooding

Profiling Hazard Event

Requirement §201.4(c)(2)(i) The risk assessment shall include an overview of the location of all natural hazards that can affect the State, including information on previous occurrences of hazard events as well as the probability of future hazard events, using maps where appropriate.

Flooding is defined as a temporary overflow of water onto lands not normally inundated by water producing measurable property damage or forcing the evacuation of people and vital resources. Floods frequently cause loss of life; property damage and destruction; damage and disruption of communications, transportation, electric service, and community services; crop and livestock damage and loss, and interruption of business. Floods also increase the likelihood of hazard such as transportation accidents, contamination of water supplies, and health risk increase after a flooding event.

Several factors determine the severity of floods including rainfall intensity, duration and rapid snowmelt. A large amount of rainfall over a short time span can result in flash flood conditions. Small amounts of rain can also result in flooding at locations where the soil has been previously saturated or if rain concentrates in an area having, impermeable surfaces such as a large parking lot, paved roadways, or post burned areas with hydrophobic soils. Topography and ground cover are also contributing factors for floods. Water runoff is greater in areas with steep slopes and little or no vegetative ground cover.

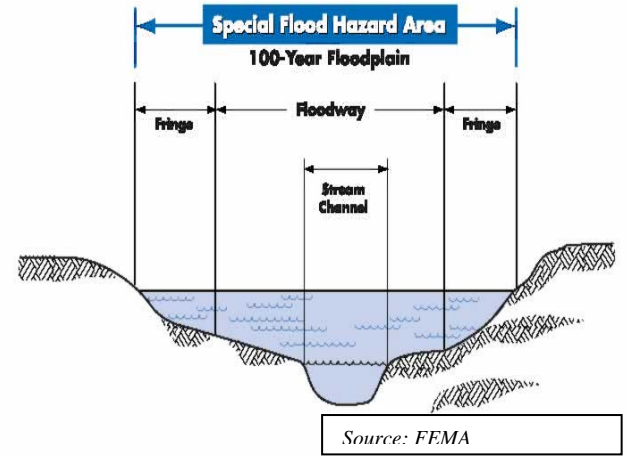
Frequency of inundation depends on the climate, soil, and channel slope. In regions where substantial precipitation occurs during a particular season or in regions where annual flooding is due to spring melting of winter snow pack, areas at risk may be inundated nearly every year.

Conditions which may exacerbate floods	
Impermeable surfaces	Constrictions
Steeply sloped watersheds	Obstructions
Debris	Droughts
Contamination	Soil saturation
Velocity	Wildfire
Soil erosion	Erosion Hazard Zones
New construction/urban development	Invasive vegetation
Climate Variability	Severe Weather Events

In in recent years Utah has seen a new kind of flood risk emerge that includes canal failures and flooding and debris flows related to watersheds damaged by wildfire. This type of flooding is distinctly different from the floods normally dealt with. Utah's farm lands are now being used for residential development. This development, occurring in a patch work fashion, is leaving irrigation canals in place to transport water to undeveloped farms. This is placing residential development near and often below irrigation canals that are not engineered and lack consistence maintenance. Irrigation canals have a history of breaching, yet development pressure has put homes at the base of many of these canals.

Post fire related flooding results from enhanced runoff from fire damaged watershed. As fires burn they destroy vegetation and often leave soils in a hydrophobic state, this alters the hydrology of the watershed, producing greater peak flows. It takes a human built environment to turn a natural event into a natural disaster. Development on the foothill all along the Wasatch Front is occurring, at rapid rates. Foothill property is considered prime real estate and is more often than not in URWIN areas on steep slopes. This serious problem of debris flows and the elevated risk of debris flow following a wildfire; is discussed further in the Landslide Section.

Explanation of Common Flood Terms



Source: FEMA

FIRM: Flood Insurance Rate Map

Fringe:
The portion of the 1-percent-annual-chance Special Flood Hazard Area (SFHA) that is not within the regulatory floodway, and in which development and other forms of encroachment may be permitted if allowed by FEMA and the community.

Stream Channel:
A naturally or artificially created open conduit that periodically or continuously contains moving water or which form a connecting link between two bodies of water

1% Special Flood Hazard area (100-year flood): Applies to an area that has a 1 percent chance, on average, of flooding in any given year. However, a 100-year flood could occur two years in a row, or once every 10 years. The 100-year-flood is also referred to as the base flood.

Base Flood: Is the standard that has been adopted for the NFIP. It is a national standard that represents a compromise between minor floods and the greatest flood likely to occur in a given area and provides a useful benchmark.

Base Flood Elevation (BFE): As shown on the FIRM, is the elevation of the water surface resulting from a flood that has a 1% chance of occurring in any given year. The BFE is the height of the base flood, usually in feet, in relation to the National Geodetic Vertical Datum (NGVD) or 1929, the North American Vertical Datum (NAVD) of 1988, or other datum referenced in the FIS report.

Flood Recurrence:

Flood Recurrence	Chance of occurrence in any given year
10 year	**10%**
50 year	2%
100 year	1%
500 year	0.20%

Special Flood Hazard Area (SFHA): Is the shaded area on a FIRM that identifies an area that has a 1% chance of being flooded in any given year (100-year floodplain).

Floodway: Is the stream channel and that portion of the adjacent floodplain that must remain open to permit passage of the base flood without raising that water surface elevation by more than one foot.

History of Flooding in Utah

Major floods are those that are extensive and have large recurrence intervals (greater than 25 years). These major events and additional floods of a more local nature are listed chronologically in Table F-1.

Stream flow records from six stream flow-gauging stations depict major floods in Utah. The selected gauging stations are on streams that represent natural runoff in Utah's principal river basins. Data from the gauging stations are collected, stored, and reported by water year (a water year is the 12-month period from October 1 through September 30 and is identified by the calendar year in which it ends).

Major floods in Utah are almost always the result of rapidly melting snow in late spring and early summer, often intensified by accompanying rain. Intense summer thunderstorms have historically caused heavy damage in several localities. .

Many other floods in Utah have been severe locally and have affected considerably smaller areas than the areas of those floods identified in Table I-18. Some of these local floods have caused substantial loss of life and property damage.

Utah has received four Presidential declarations for flooding: in 1983, 1984 and two in 2005. Following the events of 1983-84 an enormous amount of mitigation was executed along the urban areas of the Wasatch Front, which experienced severe flooding. Because of flooding Salt Lake County commenced a flood control project where pumps were installed on the Great Salt Lake. Today Utah utilizes an advanced water-monitoring network of stream gauges, SNOTEL sites, and automated stream flow gates.

Table I-18 Chronology Major and other Memorable Flood Events in Utah, 1884-2010

Flood	Date	Area Affected	Recurrence Interval (in years)	Remarks
Flood	July 4, 1884	Colorado River	>100	Probably snowmelt combined with rainfall
Flood	Aug. 13, 1923	Tributaries to Great Salt Lake between Ogden and Salt Lake City.	Unknown	Locally intense thunderstorms. Deaths, 7; damage, $3,000,000
Flood	Apr. 28- June 11, 1952	Strawberry, upper Price, upper San Rafael, Ogden, Weber, Provo, and Jordan Rivers; Blacksmith Fork, and	25 to >100	Melting of snowpack having maximum-of-record water content for Apr. 1. Disaster declared. Deaths, 2; damage, $8.4 million.

		Spanish Fork; upper Muddy and Chalk Creeks.		
Flood	June 16, 1963	Duchesne River	>100	Dam failure
Flood	June 10-11, 1965	Ashley Creek and other streams between Manila and Vernal and west of Manila.	>100	Three days of intense rainfall on thick snowpack above altitude 9,200 feet. Deaths, 7; damage, $814,000.
Flood	Dec. 6- 7, 1966	Virgin and Santa Clara Rivers.	25 to >100	Four days of light to intense rainfall of as much as 12 inches. Damage, $1.4 million.
Flood	Aug. 1- 2, 1968	Cottonwood Wash and other nearby tributaries to San Juan River.	50 to >100	Locally intense thunderstorms following 11 days of rainfall. Damage, $34,000.
Flood	Sept. 5- 7, 1970	San Juan River and tributaries from McElmo Creek to Chinle Creek.	25 to >100	Record breaking rainfall. Deaths, 2; damage, $700,000.
Flood	Aug. 27, 1972	Vernon Creek	>100	Locally intense thunderstorms.
Flood	Apr. 10- June 25, 1983	Lower Duchesne and Jordan Rivers and tributaries (including Spanish Fork); upper Price, Bear, Sevier, and San Pitch Rivers; Chalk, East Canyon, Trout, and George Creeks; Great Salt Lake and tributaries between Ogden and Salt Lake City.	25 to >100	On April 10, a landslide caused by precipitation dammed the Spanish Fork, which then inundated the community of Thistle. The landslide was the most costly geologic phenomenon in Utah's history. Affected 22 counties. Rapid melting of snowpack having maximum-of-record water content for June 1. Disaster declared by President. Damage, $621 million.
Flood	Apr. 17- June 20, 1984	White, upper Price, and Fremont Rivers; lower Bear and Sevier Rivers and tributaries; Beaver River; Red Butte Creek; Spanish Fork; Jordan River.	25 to >100	Runoff from greater than average snowpack for Apr. 1 and spring precipitation. Deaths, 1; damage, $41 million.
Flood	May 22, 1984	Sevier Lake	Unknown	Runoff in Sevier River from Nov. 1982 through June 1984 exceeded upstream reservoir capacity; about 1.5 million acre-feet of water conveyed to Sevier Lake. On May 22, 1984 lake reported to be as much as 35 feet deep after being nearly dry since about 1880.
Flood	June 15, 1984	Utah Lake	Unknown	Runoff from greater than normal precipitation since Sept. 1982 increased lake level to 101-year record of 5.46 feet above compromise level on June 15, 1984. Damage, $5.9 million.
Flood	June 3, 1986	Great Salt Lake	Unknown	Large runoff from greater than normal precipitation since Sept. 1982 increased lake level to 140-year record elevation of 4,211.85 feet on June 3, 1986. Damage, $268 million.

Flood	September 12, 2002	Santaquin, Utah County	Unknown	Post fire debris flow following a heavy localized thunderstorm, damaged homes and roads resulting in significant cleanup by local community and county.
Flood	January 8-12, 2005	Santa Clara and Virgin Rivers, Red Cliff Recreation Area	Unknown	A rain on snow event resulting from a stalled storm system brought abundant precipitation throughout the state. Damage estimates are estimated at $300 million dollars. In addition, 30 homes destroyed and 20 significantly damaged. Presidential Disaster Declaration declared February 1, 2005.
Flood	April 28, 2005 – June 29, 2005.	Lower Bear River Basin, Duchesne and Sevier basins	>100	Heavy and frequent localized precipitation events from April 28, 2005 until June 29, 2005, resulted in an estimated $2.9 million dollars in damages to public and private properties, roads, and bridges. A Presidential Disaster Declaration was declared August 1, 2005 and included Beaver, Box Elder, Kane, Sevier, Tooele, Uintah, and Wasatch counties as well as the Uintah and Ouray Indian Reservations.
Riverdale Canal	July 11, 1999,	The largest disaster in Riverdale's history occurred.		At approximately 12:08 p.m. a section of the Davis-Weber Canal gave way above the Pinebrook Subdivision. The break in the canal sent thousands upon thousands of gallons of water and mud down onto the homes below
Logan Canal	July 11, 2009	A portion of a hillside in Logan, Utah gave way, breached a canal barrier		A canal failed and sent tons of water and debris cascading into a neighborhood 150 feet below. As of this post, one home has been destroyed, eight others seriously damaged, and three people died.
Flood	June 2010	Salt Lake County, Summit County, Piute County, Uintah County, and the Unitah and Ouray Indian Reservation	>50	Water and debris flow from springtime snowmelt and precipitation caused an estimated $916,868 in damages to public and private property in multiple jurisdictions throughout the state.

April 28, 1952 - The April 28, 1952, flooding on Chalk Creek at Coalville and other flooding during the extensive April 28-June 11, 1952, floods were caused by melting, of maximum-of-record snowpack for April 1 *(U.S. Soil Conservation Service, 1983)*.

Flooding was severe in central and north-central Utah (Figure I-10), and a flood disaster was declared. Two lives were lost in boating accidents on the swollen Ogden River *(Wells,*

1957, p. 597-613). Flood damage was $8.4 million, of which $1.9 million was in Salt Lake City.

June 11, 1965 - Rainfall on melting snowpack caused the June 11,1965, flood on Ashley Creek near Vernal and the June 10-11, 1965, floods in northeastern Utah. Flooding also was severe on several other streams in the Uinta Mountains near Vernal and Manila. Areas at altitudes above 9,200 feet contributed most to the flooding. During the flood, the snowline receded from about 9,200 to 9.900 feet. Peak discharges were greater than the discharge expected to recur once in 100 years on Ashley Creek on the southern slope of the Uinta Mountains and on streams on the northern slope.

On a creek southwest of Manila, floodwaters that were the most severe in 40 years swept away and killed seven campers during the night. Within the storm area, flooding caused estimated damage of $814,000 to roads, bridges, irrigation canals, fences, and crops. *(Rostvedt and others, 1970, p. E54-E57).*

December 6, 1966 - December 6, 1966 (water year 1967), a flood on the Santa Clara River near Pine Valley occurred. A rainstorm during December 3-6 was of unprecedented aerial coverage and intensity for extreme southwestern Utah. Rainfall in the storm area ranged from about 1 to 12 inches.

Peak discharges on the Virgin and Santa Clara Rivers and other streams in the storm area had recurrence intervals that exceeded 100 years. Aerial extent of the flooding is shown in Figure F-1. Total damage to crops, fences, roads, bridges, diversion structures, cropland, forestlands, and improvements was about $ 1.4 million *(Butler and Mundorff, 1970, p. A-l9).*

Floods of 1983 - The floods of April 10-June 25, 1983, affected 22 counties, or more than three-fourths of the State. On April 10, a landslide caused by precipitation dammed the Spanish Fork, which then inundated the community of Thistle. The landslide, which resulted in damage of about $200 million and a Presidential disaster declaration, was the most costly geologic phenomenon in Utah's history. *(Utah Division of Comprehensive Emergency Management, 1985, p. 40).*

Rapid melting of snowpack that had maximum-of-record water content for June 1 (U.S. Soil Conservation Service. 1983) resulted in the largest and most widespread flooding in the State's history; peak discharges had recurrence intervals that exceeded 100 years on several streams. New discharge records were set on many others, such as Chalk Creek at Coalville.

On June 23, the Delta-Melville-Abraham-Deseret Dam on the Sevier River near Delta failed because of the flooding on June 23, 1983, and released 16,000 acre-feet of water down the river. Two bridges were washed away, and the town of Deseret was inundated by as much as 5 feet of water *(Utah Division of Comprehensive Emergency Management, 1985, p. 41).*

Overall damage from the April 10- June 25, 1983, floods totaled $621 million. No deaths were attributed to the floods. *(Stephens, 1984, p. 20-36).*

Flood of 1984 - The May 24, 1984, flood on the Beaver River near Beaver and other flooding during the April 17- June 20,1984, floods caused damage second in magnitude only to damage in 1983. The major cause of the flooding was much greater than average snowpack and greater than normal precipitation that continued throughout the spring. Peak discharges exceeded those in 1983 at some sites on the White, Bear, Jordan, and Beaver Rivers. Owing to severe flooding in 12 counties, a disaster was declared by the President.

On May 14, rainfall caused a mudslide near the coal-mining town of Clear Creek that killed one person and injured another. The direct impact on people was considerably less in 1984 compared to 1983 because of mitigation measures implemented during the previous year. Total damage for floods and landslides was estimated to be $41 million *(Utah Division of Comprehensive Emergency Management, 1985, p. 15).*

Floods not only can cause direct loss of life and property, but also can adversely affect the use and quality of surface water which results in economic and environmental costs that are not apparent immediately apparent. For example, floods transport large quantities of sediment and debris from eroding channels. Then the floods deposit materials on cropland, streets, homes, reservoirs, detention basins and stock ponds. Additionally, waterfowl nesting areas are frequently disrupted and harmed by flooding.

January 2005 Southern Utah Floods - A stalled storm-system containing abundant moisture caused significant flooding in Washington and Kane Counties in Southern Utah between January 8-12, 2005. The storm brought rain and snow throughout much of the state causing additional precipitation to accumulate in areas already containing deep snow pack. Higher snowfall and water equivalent totals equaled 70” at Cedar Breaks, 60” at Kolob-Zion Park, and 58” at Alta.

Over $300 million dollars in damages was sustained along the Santa Clara and Virgin Rivers in Washington County. Thirty homes were destroyed in the flood and another twenty homes were significantly damaged *(NCDC, 2005).*

One fatality associated with this event resulted when a man and his wife in their vehicle were caught in floodwaters in the Red Cliff Recreation Area near the Quail Creek Reservoir. Six other injuries were reported. Two additional fatalities resulted from avalanches that occurred after the storm. The avalanches occurred primarily due to the considerable amount of wet, heavy snow that fell in the higher mountain elevations during these storms (UtahWeather.org). A Presidential Disaster Declaration was declared February 1, 2005. *(Derived from Major floods in Utah is excerpted from Paulson, R.W., Chase, E.B., Roberts, R.S., and Moody, D.W., Compilers, National Water Summary 1988-89-- Hydrologic Events and Floods and Droughts: U.S. Geological Survey Water-Supply Paper 2375, 591 p.)*

June 2010 Flooding - Water and debris flow from springtime snowmelt and precipitation caused an estimated $916,868 in damages to public and private property in multiple

jurisdiction's throughout the state. Runoff from snowpack sparked by high weekend temperatures was flooding some areas threatening homes, roads and bridges in Salt Lake County. An irrigation canal in Utah County got a lot more water than it could handle threatening homes in Lehi with flooding. The Weber River also wreaked havoc through the Kamas Valley in Summit County. Flooding also occurred in the Town of Marysvale, in Piute County on Highway 89 at Moore's Old Pine Inn. The Utah Division of Homeland Security, FEMA Region VIII, and local governments conducted a joint Preliminary Damage Assessment (PDA), but eligible damages did not reach the required state threshold for a federal disaster declaration.

Assessing Vulnerability by Jurisdiction

Requirement §201.4(c)(2)(ii): *[The State risk assessment shall include an] overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments … . The State shall describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard event.*

The information from the regional hazard mitigation plans were reviewed to "ground truth" data and assumptions made in the SHMP. Specifically the review entailed determining which hazards and vulnerability from these hazards were identified as the most severe threats, such as flooding.

Given the impact from the recent economic recession, growth, such as in new construction, will remain stagnant or grow slowly. Also low net in-migration and or the inability to move due to individual financial restrictions will not change in the near future. The vulnerability from flooding will change with new flood hazard mapping becomes available or when there is an increase in new construction.

Utah's Risk MAP

Utah has significantly improved in evaluating the states vulnerability to flooding and is the state's most important tool to assess vulnerability by jurisdiction. Utah's successful Risk MAP has proven an essential element in updating Utah's Flood Insurance Rate Maps (FIRMS) and Flood Insurance Studies (FIS). Utah's Risk MAP encourages state and local governments to analyze vulnerability based on local flood risk assessments.

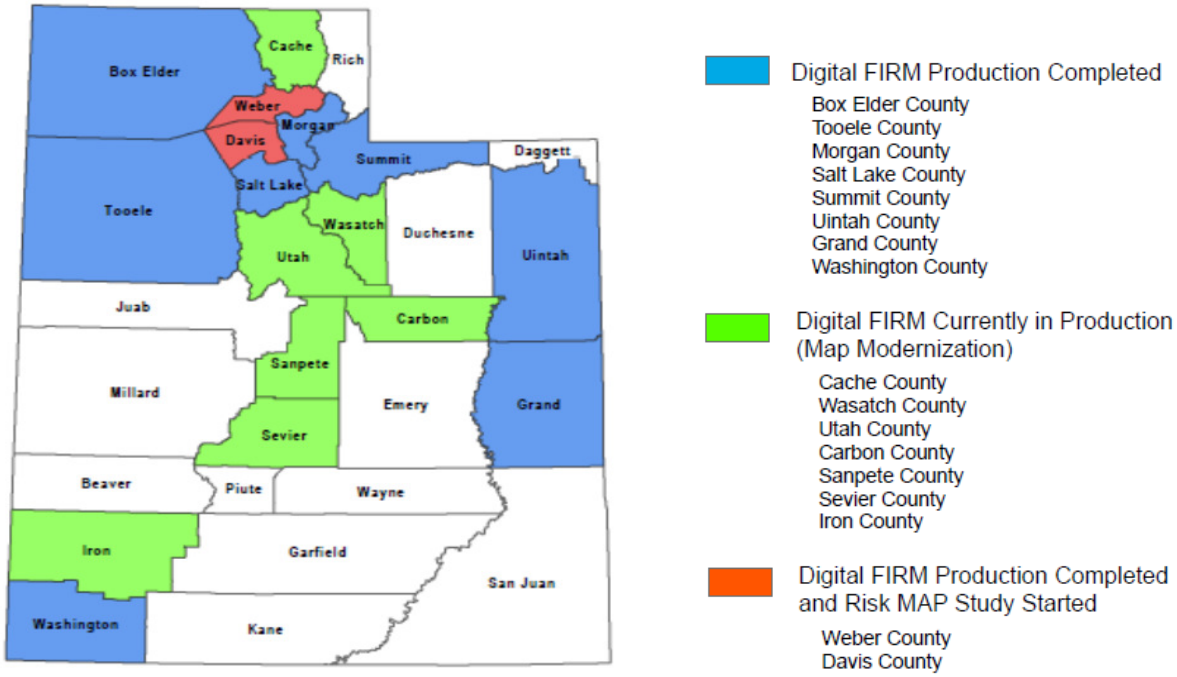
The Risk MAP has provided the state and local governments the ability assess their vulnerability using digitized flood maps. The digitized flood maps also provide a more accurate planning tool for future development in their jurisdiction as well has used to identify jurisdictions most threatened and vulnerable to flood damages.

Risk MAP is FEMA's vision to integrate all three legs of the NFIP, as well as the interrelationship to the key elements of the disaster programs; Public Assistance (PA), Mitigation Planning and Grant Programs. This will create opportunities for synergy with our state and local partners in a manner that streamlines multiple activities and builds state and local capability, which essential for the continued investment in better flood

maps and to be cost effective. Utah feels that every community should receive quality maps and mapping partners is essential to be successful in this program.

Utah's Risk MAP program will provide opportunities from mapping events and tools to tie risk identification and risk assessments to feed planning within communities to then develop long term solutions to reduce the risk. PA funding provides long term mitigation opportunity to utilize the risk mapping, assessment and planning approaches to coordinate mapping efforts in Utah. These opportunities are abound for integration and cost savings. Additional information Utah's Risk MAP, how it's managed, status of flood mapping updates and Utah's floodplain mapping successes, is available in Appendix D, Flood Mapping and Floodplain Programs.

Current Status of Utah's Digital Flood Insurance Rate Maps (DFIRMS) – 12/31/2010



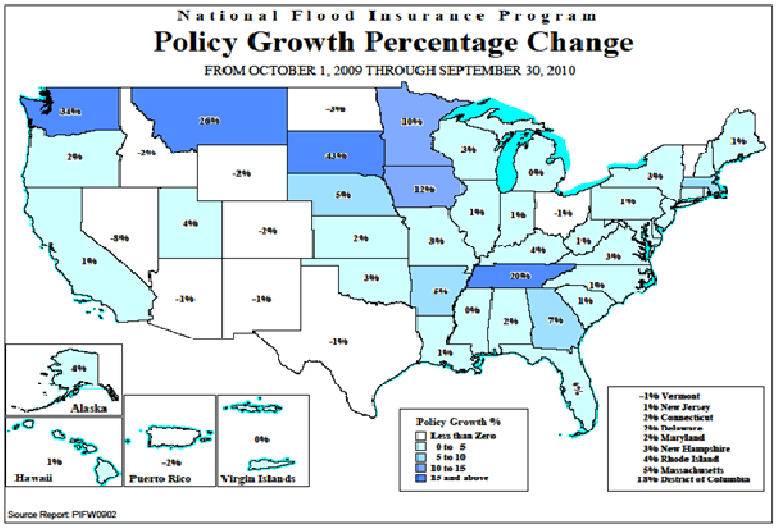
The National Flood Insurance Program, Community Assistance Program, assist local governments in implemented sound floodplain management. The State has 202 participating NFIP communities that utilized county-wide or individual Flood Insurance Rate Maps (FRIMS) to assess their flood risk and manage development in their regulatory floodplains. Forty-six percent of Utah's NFIP Communities *Have No Special Flood Hazard* or *Considered Minimally Flood Prone.* Flood policy growth has only increased 4% from 2009 – 2010.

Community NFIP Participation in Utah – 2010

(NFIP Community Status Book – 2010)

Total Number Communities in NFIP	Total Communities NOT in NFIP	Total Communities NOT in NFIP with Flood Hazards Identified	Total Communities Suspended	Total Communities with No Special Flood Hazards	Total Communities Considered Minimally Flood Prone
202	26	26	1	36	57

Figure 1 – 23 - NFIP Flood Insurance Statistics for Utah (1/1/78-02/03/11)	
Policies in-force	4,273
Insurance in-force	$923,712,700
Premiums in-force	$2,618,032
Total losses	815
Total payments	$5,498,398



Community Rating System (CRS) Eligible Communities - 2010

- City of Bountiful, Class 9
- City of Centerville, Class 7
- City of Logan, Class 8
- City of Moab, Class 8
- City of North Ogden, Class 9
- City of Orem, Class 7
- City of Provo, Class 8
- City of Santa Clara, Class 9
- City of St. George, Class 7
- City of West Bountiful, Class 9

Estimating Potential Losses by Jurisdiction

Requirement §201.4(c)(2)(iii) The State risk assessment shall include an overview and analysis of potential losses to the identified vulnerable structures based on estimates provided from local risk assessments as well as the State risk assessment. The State shall estimate the potential dollar losses to State owned or operated buildings, infrastructure, and critical facilities in the identified hazard areas

The information from the regional hazard mitigation plans were reviewed to "ground truth" data and assumptions made in the SHMP. Specifically the review entailed determining which hazards were identified as the most severe threats.

The HAZUS-MH Flood was used as a starting point for the state's evaluation of flood vulnerability by jurisdiction. A group of floodplain experts were assembled to provide a qualitative vulnerability assessment, classifying each county into a high, medium, or low flood vulnerability rating.

Experts included the State Floodplain Manager, State Hazard Mitigation Officer, Risk Map Manager, the Earthquake Program Manager, Mitigation and Recovery Section GIS Intern, he U.S. Army Corps of Engineers, and members of the State Hazard Mitigation Team.

After reviewing the HAZUS data Table 1-2, and regional mitigation plans and their ranking of risk, the analysis in Table 1-3 was developed. The information and ranking identified in Table 1-4, was not only based on individual expertise, but by an in depth analysis of flood risk and flood vulnerability analysis from data and information found in the regional multi-jurisdictional mitigation plans.

Table 1-2 Vulnerability HAZUS MH 2010 - Flood Loss Estimates - County			
High			
Washington	Morgan	Wayne	Grand
Carbon			
Medium			
Salt Lake	Duchesne	Juab	Millard
Iron	Piute	Garfield	Kane
Box Elder	Cache	Utah	Wasatch
Emery	Uintah	Sanpete	Carbon
Low			
Tooele	Davis	Daggett	Sevier
Summit	Weber	Beaver	Rich

Table 1-3*Vulnerability Based On Multi Jurisdiction Regional Mitigation Plan(s) Flood Loss Evaluated by County			
High			
Salt Lake	Davis	Weber	Utah
Summit	Morgan	Washington	
Medium			
Box Elder	Cache	Grand	Wasatch
Iron	Uintah	Sevier	Kane
Duchesne	Piute	Garfield	Tooele
Sanpete	Wasatch		
Low			
Emery	Wayne	Daggett	Carbon
Millard	Juab	Beaver	Rich

*based on internal review of /regional mitigation plans

Table 1-4 Estimating Flood Damage Losses by Population Using HAZUS MH Flood

County Population Ranking	Building Count Ranking *	Building Damage Loss Ranking **	Building Exposure Ranking ***	Total Direct Econ. Bldg. Loss Ranking ****
1. Salt Lake	1	1	1	1
2. Utah	3	3	2	3
3. Davis		8	3	8
4. Weber	4	4	4	4
5. Washington	2	2	5	2
6. Cache	5	5	6	6
7. Tooele			9	
8. Iron	7	6		5
9. Summit		10	7	
10. Uintah				

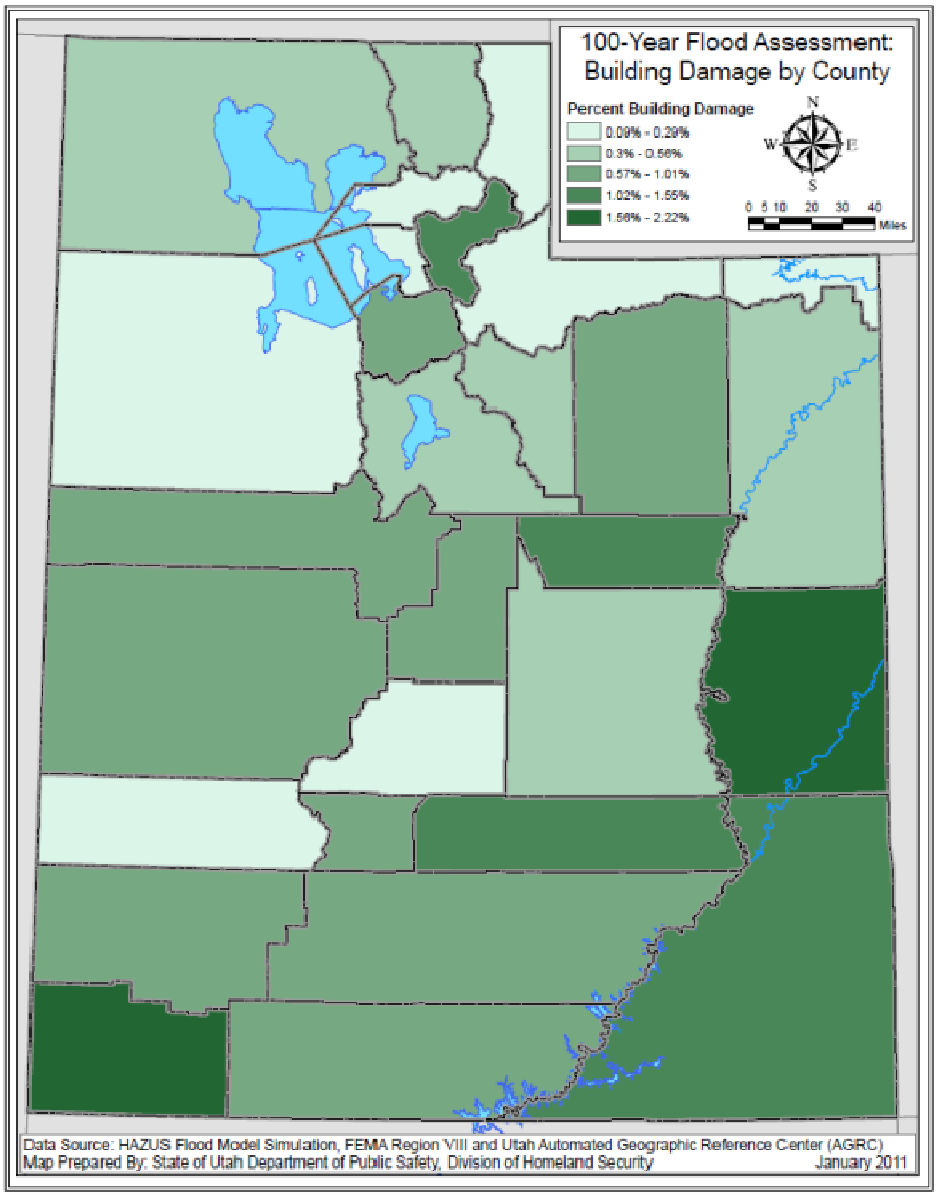
*Carbon 6th, Grand 8th, Box Elder 9th, Morgan 10th
**Carbon 7th, Grand 9th,
*** Summit 8th, Grand 10th
****Grand 7th, Sanpete 9th, Sevier 10th

County Flood Losses (Adjusted for Inflation) 1980 - 2010				
County	Injuries	Fatalities	Property Loss	Crop Losses
Beaver	0	0	$5,226,280	$5,159,877
Box Elder	8	0	$1,939,144	$19,833
Cache	0	0	$6,812,611	$5,178,546
Carbon	1	3	$591,102	$5,158,713
Daggett	0	0	$262,325	$10,000
Davis	0	0	$5,914,802	$5,193,256
Duchesne	0	0	$5,360,627	$5,163,946
Emery	2	0	$81,859	$8,981
Garfield	2	2	$6,316,643	$5,222,254
Grand	0	0	$993,558	$0
Iron	0	0	$7,425,665	$5,173,302
Juab	1	0	$5,273,184	$5,159,877
Kane	0	0	$192,787	$16,847
Millard	1	0	$5,347,614	$5,159,878
Morgan	0	0	$5,387,892	$5,164,978
Piute	0	1	$131,560	$27,831
Rich	0	0	$5,158,713	$5,158,713
Salt Lake (2)	2	2	$181,610,348	$5,159,922
San Juan	1	1	$7,868,439	$5,208,769
Sanpete	1	0	$6,821,162	$5,850,476
Sevier	0	0	$5,315,669	$5,159,877
Summit	0	0	$5,404,170	$5,158,713
Tooele	0	1	$5,864,402	$5,180,817

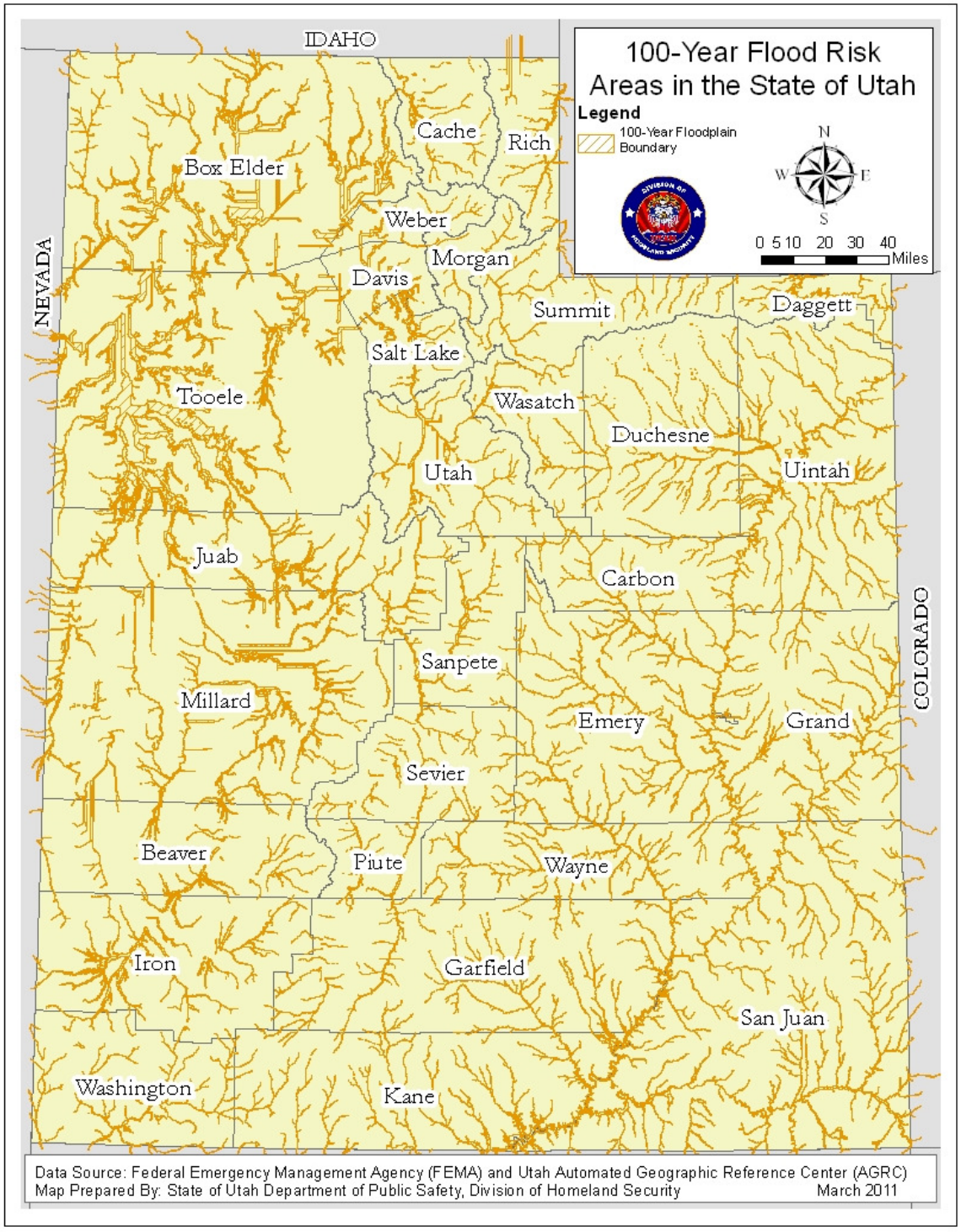
Uintah	2	0	$5,719,391	$5,158,713
Utah (5)	0	0	$10,111,515	$5,278,253
Wasatch	0	0	$147,344	40
Washington (1)	13	4	$357,974,966	$5,206,179
Wayne (4)	0	1	$8,908,365	$10,297
Weber (3)	0	0	$13,671,851	$5,187,685

Source: SHELDUS 2009

Assessing Flood Damage by County – 100-year Flood, HAZUS MH



State Floodplains 2011 – HAZUS Flood



Counties Ranked by Flood Loss Per Capita Based on FEMA HAZUS FLOOD – 100 Year Return

County	Per Capita Loss
Grand	$2.96
Washington	$2.40
Morgan	$1.95
Carbon	$1.56
Iron	$1.37
Wayne	$1.32
Millard	$1.28
Salt Lake	$1.24
Garfield	$1.22
Wasatch	$1.18
Piute	$1.17
Kane	$1.09
Sanpete	$0.92
Duchesne	$0.89
Rich	$0.85
Juab	$0.85
San Juan	$0.78
Summit	$0.69
Emery	$0.54
Cache	$0.48
Uintah	$0.47
Box Elder	$0.42
Utah	$0.41
Weber	$0.29
Sevier	$0.29
Tooele	$0.20
Beaver	$0.18
Daggett	$0.16
Davis	$0.10

Assessing Vulnerability by State Facilities

Requirement §201.4(c)(2)(ii): [The risk assessment shall include an] overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in …the State risk assessment. …State owned critical or operated facilities located in the identified hazard areas shall also be addressed…

State owned and operated facilities are important centers that link the State to the public it serves. These facilities are hubs for everything from administrative activities to public safety functions. Should these facilities become inoperable by a natural like floods or

man-made hazard, the public will have lost a vital link between them and their government and the services their government provides.

The number of state facilities and their insured value was generated by the Utah Division of Risk Management. The information is current the best available data and was used to assess flood vulnerability.

Number State Facilities and Insured Value 2009

County Name	Number of Facilities	Insured Value
Beaver	43	$59,658,705
Box Elder	135	$384,071,542
Cache	586	$1,520,883,525
Carbon	135	$208,266,895
Daggett	29	$15,121,339
Davis	352	$1,473,229,390
Duchesne	102	$162,843,693
Emery	111	$111,498,739
Garfield	75	$56,085,456
Grand	79	$49,168,990
Iron	230	$542,074,952
Juab	73	$86,657,955
Kane	71	$59,766,836
Millard	85	$151,693,827
Morgan	67	$71,260,550
Piute	24	$17,118,968
Rich	63	$22,581,600
Salt Lake	2221	$9,243,977,141
San Juan	104	$155,374,819
Sanpete	189	$400,181,595
Sevier	127	$194,770,108
Summit	143	$286,656,757
Tooele	94	$325,264,444
Uintah	131	$232,447,687
Utah	625	$2,874,167,305
Wasatch	156	$178,608,368
Washington	252	$814,071,164
Wayne	36	$17,077,394
Weber	398	$1,595,063,587
OVERALL TOTAL	**6736**	**$21,309,643,331**

Estimating Potential Losses by State Facilities

Requirement §201.4(c)(2)(iii) [The risk assessment shall include the following:]…[a]n overview and analysis of potential losses to identified vulnerable structures, based on estimates provided in …the State risk assessment. The State shall estimate the potential dollar losses to State-owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas.

The following table shows estimated flood losses to state facilities based on the nine counties with Digital Flood Insurance Rate Maps (DFIRMs). This table will be updated as more DFIRMs become available.

County Name	Count Facilities	Insured Value	Facilities in Flood Risk Areas (A Zones, V Zones and Shaded X Zones)	Insured Value of Facilities in Flood Risk Areas
Beaver	43	$59,658,705		
Box Elder	135	$384,071,542	15	$32,057,763
Cache	586	$1,520,883,525		
Carbon	135	$208,266,895		
Daggett	29	$15,121,339		
Davis	352	$1,473,229,390	24	$86,265,857
Duchesne	102	$162,843,693		
Emery	111	$111,498,739		
Garfield	75	$56,085,456		
Grand	79	$49,168,990		
Iron	230	$542,074,952		
Juab	73	$86,657,955		
Kane	71	$59,766,836		
Millard	85	$151,693,827		
Morgan	67	$71,260,550	10	$6,679,482
Piute	24	$17,118,968		
Rich	63	$22,581,600		
Salt Lake	2221	$9,243,977,141	70	$223,176,238
San Juan	104	$155,374,819		
Sanpete	189	$400,181,595		
Sevier	127	$194,770,108		
Summit	143	$286,656,757	9	$37,495,994
Tooele	94	$325,264,444	2	$1,437,480
Uintah	131	$232,447,687	8	$2,207,114
Utah	625	$2,874,167,305		
Wasatch	156	$178,608,368		
Washington	252	$814,071,164	15	$17,233,641
Wayne	36	$17,077,394		
Weber	398	$1,595,063,587	7	$1,776,632
OVERALL TOTAL	**6736**	**$21,309,643,331**	**160**	**$408,330,201**